



SATURDAY, DECEMBER 9, 1871.

Balanced Slide-Valves for Locomotive Engines.

BY MR. WILLIAM G. BEATTIE.

The ordinary slide-valve that is generally used in locomotives has the serious disadvantage that the pressure upon it when working is so heavy as to cause great wear of the rubbing faces of the valve and cylinder ports; and the force expended in overcoming this friction is a considerable loss of power, and involves serious wear of the valve gear, and difficulty of quickly altering or reversing the action of the valve.

An ordinary locomotive slide-valve is shown in figs. 7 and 8, having 1 inch outside lap; and the area of this valve that is under pressure during the portion of the stroke in which steam admission takes place, which may be taken at one-third of the stroke, extends from the edge of the steam port at *A* to the end of the cylinder port facing at *E*, being 10 inches length by 17 inches width of the valve over the flanges, or an area of 170 square inches under steam pressure, for an engine with 17-inch cylin-

the first third of the stroke, 1,901 pounds in the second third, and 2,133 pounds in the last third, or a mean pressure of 1,490 pounds throughout; and deducting this from the 22,000 pounds pressure on the back of the valve, there remains an effective pressure of 20,510 pounds, or 9 tons upon the back of each valve, and 18 tons upon the pair of valves. In the valves of the passenger engines on the South Western Railway the outside lap is $1\frac{1}{4}$ inches instead of 1 inch as in the above calculation, which increases the pressure upon each valve to 10 tons.

For the purpose of measuring the actual power required to move the valves under these circumstances, experiments have been tried by the writer by removing the valve link-motions of an engine and connecting the valve-spindle to a lever having the proportion of 20 to 1; from the extremity of the lever a cord was led over pulleys to the front of the engine, and weights were there hung on the cord until the valve began to move, a steam pressure of 125 pounds per inch being maintained in the valve-chest. In the first experiment, which was several times repeated, the weight required to move the valve was 308 pounds, amounting to a force of 6,160 pounds exerted on the valve-spindle. But as the motion of the valve when once started became rapidly accelerated, a smaller weight was applied to the cord and the valve was started by hand; and the weight then required to maintain motion steadily in the valve was found from several experiments to be 231 pounds, amounting to a force of 4,620 pounds at the valve-spindle. Then taking the length of stroke of the valve to be 4 inches and the stroke of the piston 22 inches, the power required to be exerted at the piston to maintain the motion of the valve will be $\frac{1}{2} \times 4,620$

article has been designed by Mr. Beattie. In figs. 1 and 2 it is shown as applied to outside cylinder passenger engines, and in fig. 6 as applied to inside cylinder goods engines.

The body of the valve *F* is similar in shape to the old *D* valve, being more cylindrical at the back, figs. 2 and 6; and it works inside a jacket *C* of corresponding form, fixed in the steam-chest by the studs *H H*, fig. 2. The steam pressure is excluded from the back of the valve by two steam-tight packing rings *J J*, figs. 1 and 3, one at each end of the valve, which are fitted into grooves in the body of the valve, and pressed onwards against the jacket by the spiral springs *L L* placed radially. At the lower side of the valve, the back is turned to the same radius as the jacket for a short portion *K* of the arc, figs. 2 and 6, and is there in contact with the jacket; the remaining portion of the back is shaped to a smaller radius, so as to be 1-16th inch clear of the jacket. The packing rings *J* are pressed by the studs *I* into the upper angle formed by the jacket and cylinder face, opposite to the lower angle filled by the body of the valve at *K*. Steam is admitted behind the rings at suitable openings, and the rings are grooved, as shown in section at *J J* in fig. 1, to reduce their surface in contact with the jacket. In figs. 4 and 5 are shown two other arrangements of the packing rings that have been tried.

The position of the packing rings at each end of the valve is determined by the width of the steam port, as it is necessary to expose to steam pressure at each end of the valve an extent of the back of the valve equal to the area of the port, in order that the valve may not be lifted from the cylinder face by the pressure of steam in

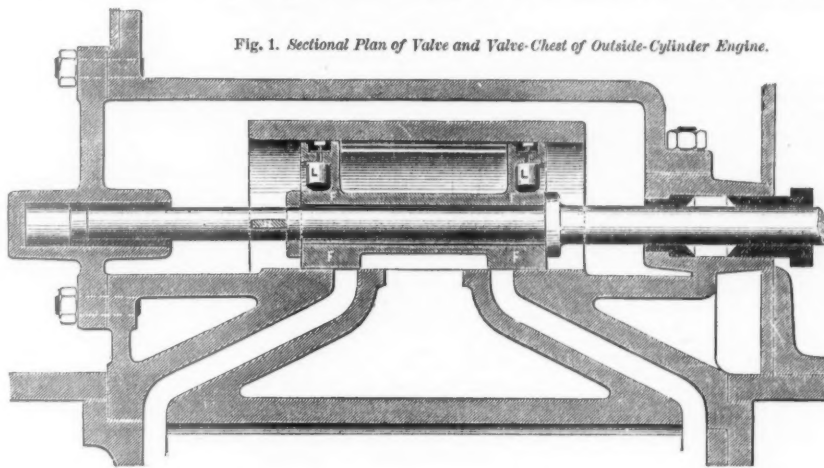


Fig. 1. Sectional Plan of Valve and Valve-Chest of Outside-Cylinder Engine.

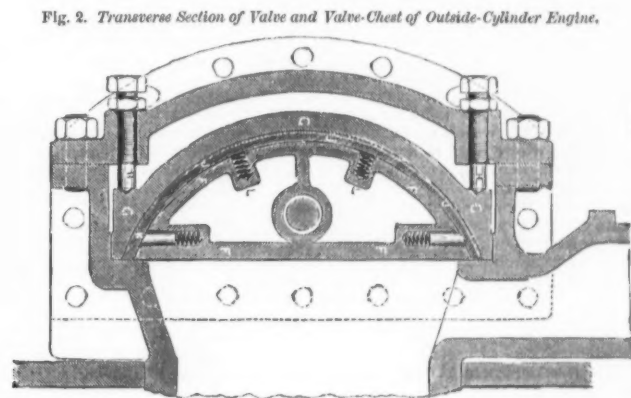


Fig. 2. Transverse Section of Valve and Valve-Chest of Outside-Cylinder Engine.

ORDINARY UNBALANCED LOCOMOTIVE SIDE-VALVE.

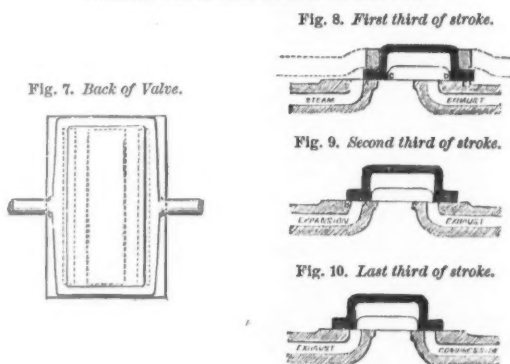


Fig. 4. Section of Packing with Radial Springs.



Fig. 5. Section of Packing with Lateral Springs.

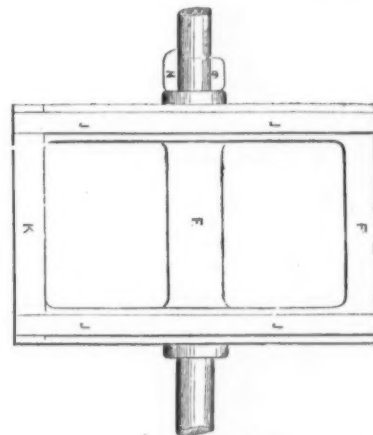
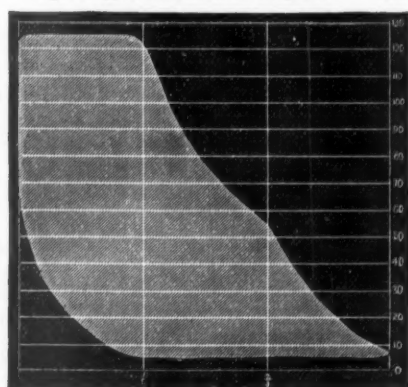


Fig. 3. Back of Valve.

ders. During the remaining two-thirds of the stroke after the steam port is closed, the whole area of the valve is under steam pressure, being $10\frac{1}{4}$ inches length by 17 inches width, or 178 square inches area; and this gives an average throughout the stroke of 176 square inches area, which at 125 pounds per inch pressure of steam in the valve-chests amounts to a total pressure upon the back of the valve of 22,000 pounds.

From this pressure on the back of the valve has to be deducted the pressure under the valve, exerted by the steam in the cylinder; and taking the exhaust to open at two-thirds of the stroke, this pressure under the valve will be in the first third of the stroke that of the exhaust steam only, acting on the area *U D* of the inside of the valve, fig. 8. In the second third of the stroke, fig. 9, there will be in addition the pressure of the expanding steam within the cylinder acting upon the area of the steam port *A B*; and in the last third of the stroke, fig. 10, there will be the pressure of the exhausting steam from the cylinder acting on the inside of the valve, with the addition of an average area of half the steam port, and also the pressure of the compression at the other end of the cylinder acting on the area of the other steam port. From the results of indicator diagrams taken with the same pressure of steam, 125 pounds per inch, at a speed of 20 miles per hour, these several pressures may be taken as follows, as shown in the approximate indicator diagram, fig. 11. In the first and second thirds of the stroke, 5 pounds per inch for the exhaust steam pressure; in the second third, 81 pounds mean pressure of the steam in the cylinder expanding from 125 pounds into double the volume; and in the last third of the stroke, 16 pounds mean pressure of the exhausting steam, and 33 pounds mean pressure of the compression. The size of the steam port being $14\frac{1}{4}$ inches by $1\frac{1}{4}$ inches, and the inside of the valve $14\frac{1}{4}$ inches by 6 inches, or 18 square inches and 87 square inches area respectively, the total pressure under the valve amounts to 435 pounds in

Fig. 11. Approximate Indicator Diagram.



pounds or 840 pounds. To this has to be added the power required to overcome the friction of the eccentric straps; and as this acts on a diameter of 14 inches, the proportionate force at the piston will be $\frac{1}{2} \times 4,620$ pounds or 2,940 pounds; and taking the coefficient of friction at one-twelfth, the power required at the piston will be $\frac{1}{12} \times 2,940$ pounds, or 245 pounds. The total of the two resistances amounts to a force of 1,085 pounds at the piston, and the piston being 17 inches diameter, this is a constant deduction of 5 pounds per square inch from the effective steam pressure upon the piston, or a loss of about 8 per cent. of the effective power of the engine.

For the purpose of reducing this serious loss the balanced slide-valve forming the subject of the present

the cylinder after the cut-off has taken place. As the space intervening between the two packing-rings in fig. 1 is the portion that is free from pressure, the necessary area for the steam pressure on the back of the valve is obtained by setting back the inner edge of each packing-ring to the required distance from the end of the valve. The spindle of the valve is a straight bar passing freely through it and held in position by the cotter *N*. The back of the valve may be open, as shown in figs. 1 and 3; or it may be closed in and the exhaust passage bridged over, so that the steam may pass through the valve from one end of the steam-chest to the other. The valves are made by preference of hard cast iron, and the packing-rings are also of cast iron.

For the purpose of measuring the actual power required to move these balanced valves an experiment was carried out similar to that before described for the ordinary valves. The result obtained was that a weight of 98 pounds, equal to a force of 1,960 pounds acting at the valve-spindle, was required to maintain motion. It appears, therefore, that while a force of 4,620 pounds was required to move the ordinary brass valve, the balanced cast-iron valve was moved with a force of 1,400 pounds, or only 30 per cent. of the power required to move the ordinary valve. The amount of pressure on the back of the balanced cast-iron valve is equal to the pressure of steam at 125 pounds per square inch, acting on the area of $1\frac{1}{4} \times 17$ inches at each end; and the area of the ungrooved packing-rings (figs. 4 and 5) in contact with the jacket is 1×22 inches for each ring; the total area of rubbing surface under the pressure of 125 pounds per inch is, therefore, 86 square inches, giving a total pressure of 10,750 pounds. Taking, then, the coefficient of friction to be one-tenth, the power required to move the valve should be 1,075 pounds, and by actual trial it amounted to 1,400 pounds.

In reference to the results practically obtained by the employment of these balanced valves, the first point to be noticed is the mechanical advantages attending their use;

and not the least important is the facility of moving the reversing lever with steam on and the avoidance of the excessive wear and tear to which the ordinary valves and the link-motion working them are subjected. It has been found also in practice that there is a considerable saving both in first cost and maintenance with the balanced valves. As the strain upon the valves is so much reduced, they may safely and advantageously be made of light, construction, and of cast iron in place of brass; and thus the first cost is much diminished. The cost of a pair of ordinary brass valves and spindles complete for main-line coupled passenger engines average £13 13s.; while the cost of a pair of balanced valves complete for the same class of engines is only £5 7s. There is thus a saving of £8 6s. per engine in first cost. The cost of a pair of ordinary brass valves and spindles complete for passenger tank engines amounts to £10 2s., while the cost of a balanced slide valves and spindles for the same class of engine is only £4 18s., showing a saving of £5 4s. in first cost. The cost of a pair of ordinary valves and spindles complete for six-wheel-coupled goods engines is £11 11s., while the cost of the balanced valves is £6 19s., showing a saving of £4 12s. per engine in first cost.

With regard to maintenance, it has been found that the wear of the balanced valves is very slight, and it appears probable that they will last six or seven years before requiring to be renewed. Taking, therefore, the life of the ordinary brass valve at eighteen months, it is evident that a great reduction in expense and maintenance is gained with the balanced valves. The packing rings required to be renewed about once a year, and the grooves cleaned out, the jackets rebored and the valves and cylinders faced; the expense of this repair is about £2 per engine. The valve motion requires slight repair, such as new pins, about once in two years; and contrasting this with the heavy repairs required by the ordinary valves and valve motion, it is seen that there is a great economy in favor of the balanced valves.

Another source of economy is the saving power required to work the balanced valves, and the consequent saving in fuel, which is an important consideration on railways, where fuel is so expensive. By reference to the recorded consumption of fuel per mile on the London & Southwestern Railway by twelve engines after being fitted with the balanced valves, as compared with their rate of fuel consumption previously, when working with the ordinary valves, and taking a period of twelve months in each case for comparison, it has been found that the passenger engines have consumed 2½ pounds less coal per mile since they were altered. It is expected that after some extended experience an average saving of at least 2½ pounds per mile with both passenger and goods engines will be the result; and this amount becomes important when taken as extending over the whole mileage of the year.

Finally, it may be stated that no greater difficulty is found in keeping the balanced valves steam-tight than is experienced with the ordinary pistons; and that no instances of valves or valve spindles breaking have occurred up to the present time. As many as 180 engines have been fitted with the balanced valves, which are now applied to all engines either newly built or in shop for repair, the result of the past two and a half years' working having proved so satisfactory.—*The Artizan.*

THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

Official Report of the Fourth Annual Convention, Held in Louisville, Ky., September 12, 13 and 14, 1871.

[CONCLUDED FROM PAGE 363.]

SUBJECTS FOR DISCUSSION AT NEXT MEETING.

The Committee appointed to choose subjects for discussion for the ensuing year, then made the following report:

Subjects for Discussion.

- Boilers and boiler material.
- Boiler incrustation.
- Boiler explosions.
- Safety valves.
- Construction of valves and valve gearing.
- Steel tires.
- Best method of securing driving and truck brasses.
- Best method of constructing tender trucks.
- Is there any method or device for packing stuffing boxes more economical than hemp?
- Application of compression brakes.
- Comparative performance and cost of operation of eight and ten-wheel engines for freight service.
- Comparative performance and cost of operation of ten-wheel engines with six drivers coupled, and eight-wheel engines with four drivers coupled.
- Uniform system of computing mileage of engines doing switching service.
- Uniform system of examination for promotion of locomotive firemen.
- Advisability of establishing different grades of locomotive engineers according to length of service, character, etc.

Mr. Burke, Memphis & Charleston Railroad—Mr. President, I would like to see a committee appointed to report on the relative merits of narrow and broad-gauge railroads. I am speaking of a narrow gauge of 2½ feet. It is a subject that is engaging the attention of railroad men and scientific men generally. I think it is important that it should be discussed in this Association at our next meeting. I would like to see our most experienced men appointed on such committee.

The motion was adopted and the committee ordered.

MISCELLANEOUS.

The President announced that it would be necessary to take some action in regard to assessments, to defray the expenses of the Association. It has been customary to appoint a committee to receive the amount, and it should be attended to to-day.

Mr. Johann, Missouri Pacific Railroad—I move that a Committee on Assessments be appointed.

Mr. Hayes, Illinois Central Railroad—I believe the Committee on Finance have not made their report yet, and would it not be well to defer this till they have, that the Association may see how we stand? They will then know better what assessment to make upon each member.

Mr. Johann's motion was then adopted, and the following committee was appointed: Philbrick, Maine Central Railroad; McAllister, West New Jersey Railroad; Towne, Hannibal & St. Joseph Railroad.

Mr. Towne, Hannibal & St. Joseph Railroad—I would like to inquire whether there has been any report on valves, valve-gear and the expansiveness of valves.

The President—There has been no report sent. It was called for this morning. I received a letter from Mr. Thompson, of the Eastern Railway, regretting his inability to be here. He had accepted the superintendency of that road, and Mr. Coolidge was in bad health. Mr. Nesbitt has left the Kentucky Central, and I presume there is no report. I have since understood that Mr. Thompson did not accept the situation as Superintendent.

Mr. Towne, Hannibal and St. Joseph Railroad—I would like to inquire whether they were required to speak of the expansion of valves or simply valve-gear.

The President—I think merely on lap and lead, Mr. Towne; but with the subject for next year we will have the consideration of the construction of valves and valve-gear, taking up the different kinds of slide valves, and it was thought it would include all the details of valves and valve motion.

REPORT ON LAP AND LEAD OF SLIDE VALVES.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee, on lap and lead of slide valves last year, suggested that in view of the limited number of replies received the subject be continued through the ensuing year, hoping thereby to elicit something of additional importance.

The Committee, in addition to tabulated form of questions, requested each member to give the results of any experiments they may have made with valves of different lap and lead, etc.

They have received replies from a much larger number than last year, and from them we find that the results are very much the same; so much so that the Committee in making up a report could only duplicate the report of last year, which they do not think necessary.

They would, therefore, refer you to the report of last year upon the subject, and request to be discharged from further consideration of the same.

Respectfully submitted,

JOHN THOMPSON, } Committee.
Geo. A. COOLIDGE, }

[Note.—The above report was received after the adjournment of the Association.—SECRETARY.]

RESIGNATION OF THE SECRETARY.

Mr. Dodge—Mr. President and gentlemen of the Association: In this connection I desire to say to the Association that under the existing circumstances I feel that they should have for a Secretary some person who would bring to the duties of that office more ability than I have been able to do. I therefore take occasion to tender my resignation. I am deeply sensible of the honor conferred upon me for the last three years, and have endeavored to deserve it as well as I could; but under the circumstances I think the Association desires the services of some one else, and I am willing they should have it.

Mr. Sellers, Memphis & Charleston Railroad—Mr. President, I move the resignation of Mr. Dodge as Secretary of this Association be accepted; and that the thanks of the Association be tendered him for the faithful, earnest and efficient manner in which he has discharged the duties of his office. Adopted.

The President—The Association having accepted the resignation of Mr. Dodge, the next business in order will be the election of a Secretary.

Mr. Burke, Memphis & Charleston Railroad, moved that a committee of three be appointed by the Chair to nominate some suitable person to act as Secretary.

The motion was adopted and the following committee appointed: Burke, Memphis & Charleston Railroad; De Clercq, Toledo, Peoria & Warsaw Railway, and Garfield, Hartford, Providence & Fishkill Railroad.

Mr. Skidmore moved that a committee be appointed to nominate places to be presented to the Association for its choice for the next place of meeting. Adopted.

The Chair then appointed the following committee: Thomas Kerr, Camden & Amboy Railroad; J. Johann, Missouri Pacific Railroad, and F. A. Waite, Boston & Maine Railroad.

Mr. M. Sellers, in behalf of Mr. Williams, moved, in connection with a paper presented, that a special committee be appointed on the relative merits of straight and wagon-top locomotive boilers. Adopted.

PLACE OF NEXT MEETING.

The committee on next place of meeting then presented the following report:

GALT HOUSE, LOUISVILLE, Ky., Sept. 14, 1871.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your committee, to whom was referred the selection of your next place of meeting, beg leave to present the following places for your consideration, viz.: Boston, Mass.; Washington, D. C.; Paterson, N. J.; and Chicago, Ill.

THOMAS KERR, } Committee.
F. A. WAITE, }
J. JOHANN, }

Report received and committee discharged.

Mr. Setchell moved that the Association proceed to vote by ballot for the cities named. Adopted.

Mr. Chapman (Vice-President) moved that two tellers be appointed to receive and count the ballots. Adopted.

The Chair then appointed Messrs. Ham, New York Central Railroad, and White, Evansville & Crawfordsville Railroad, to act as tellers.

The ballot was then taken, which resulted as follows: Boston, 51; Chicago, 3; Paterson, 2; Washington, 6.

Mr. Burke, Memphis & Charleston Railroad, moved that Boston be made the unanimous choice of the Association. Adopted.

The Secretary presented the report of Committee on PROPORTION OF WATER SUPPLAGE AND STEAM SPACE TO HEATING SURFACE.

To the American Railway Master Mechanics' Association:

GENTLEMEN: The question referred to the consideration of your Committee is as follows:

"What proportion should the surface of the water in the boiler bear to the heating surface; and what should be the amount of steam space for a given heating surface to insure the best results?"

The importance of extent in the surface of water in a boiler consists in the facility afforded for the ready egress of steam as evolved by the heating surface. Obviously, the most favorable conditions possible exist when the water surface is equal to the heating surface, and situated directly above it. Any deviation from this relation must, it would seem, be attended with some disadvantage, though doubtless inappreciable, until the disproportion arising from the increase of heating surface becomes very great.

In the case of the locomotive boiler, however, to which it is presumed the above question refers, it is useless to inquire what ratio the water surface should bear to the heating surface, since the former is, of necessity, limited. At the utmost, by any possible construction, whatever the heating surface, the area of water surface can be no greater than the product obtained by multiplying the length of the boiler and fire-box by the diameter of the boiler, with a small addition for the greater width of the fire-box. And every additional row of flues, to increase the heating surface, reduces this area still further.

Inasmuch, then, as the area of heating surface is supposed to be fixed, and that of the water surface is not determinable

at will, but necessarily restricted, and the more so as the other is increased, the practical question becomes rather, "With how small a water surface, relatively to the heating surface, may satisfactory (not absolutely the best possible) results be obtained?"

This question, it is plain, is not susceptible of solution by scientific method, but must be determined by experiment.

So with the matter of steam space. To secure dryness of steam and steadiness of action, a large space would be desirable. Were it possible to fix at will the amount of steam space in a boiler, it would not be difficult to determine approximately, for a given heating surface or for a given amount of steam to be evolved in a given time, how large a space would be desirable as a reservoir. But, limited as it is by the same considerations as restrict the water surface, the practical question becomes here, as before, "With how small a steam space may satisfactory results be obtained?" And this, too, can be determined only by experiment.

It should be added that some of the evils arising from the restriction of steam space are greatly alleviated by well-known devices—as the addition of domes and "dry pipe;" while in the case of the water surface no such devices are available.

The only practical rule, then, for the construction of boilers with respect to the matter of our question, would be: For a given heating surface, to secure as large a water surface and steam space as possible—the larger the better—within the limits imposed by the necessary restrictions in size of a locomotive boiler.

Your Committee would add, as a contribution toward an experimental solution of the question proposed to them, that excellent performance has been obtained from boilers in which, as ascertained by careful measurement and computation, the area of the water surface is from one-fifteenth to one-thirteenth that of the heating surface, and the steam space about one cubic foot to each square foot of water surface. In these cases the whole interior surface of the flues and fire-box is reckoned as heating surface, which is more than some authorities allow.

Respectfully submitted,

J. W. PHILBRICK, }
Maine Central Railroad, }
WM. JACKSON, } Committee.
Master Mechanic, Rome, Watertown &
Ogdensburg Railroad, }
E. O. HILL, }
Gen. Master Mechanic, Erie Railroad, }

On motion, the report received and ordered to be spread upon the minutes.

Mr. Burke, Chairman of the Nominating Committee for the Secretaryship, reported the name of J. H. Setchell, Little Miami Railroad.

Mr. Kerr, Camden & Amboy Railroad, moved that the vote be taken by ballot. Adopted.

Mr. Burke—I think I express the views of the Committee in saying they do not wish to debar any other nominations. Of course others can be made if desired.

The Chair appointed Messrs. Ham, New York Central Railroad, and White, Evansville & Crawfordsville Railroad, tellers, and the ballot was then taken, resulting as follows: Setchell, 46; Dodge, 2; Towne, 1; M. Sellers, 1.

On motion of Mr. Ham, New York Central Railroad, the election was then made unanimous.

The President—Mr. Setchell, I am happy to inform you that this Association has unanimously elected you Secretary for the ensuing year.

Mr. Setchell—Mr. President and Gentlemen of the Association: I am deeply sensible of the compliment you have paid me in electing me your Secretary, and if this was the beginning of our organization I might enter upon the duties of the position you have assigned me without any misgivings as to my ability to perform them. But I can hardly expect to come up to the example set before me in the ability and energy of the retiring Secretary, unless I receive the unanimous support of all the members of the Association, and that I shall expect. A master mechanic who faithfully attends to the business of his company finds necessarily much of his time taken up by his official duties. It will, therefore, be impossible for me to attend to all the details of the office; yet I promise to exercise a general supervision over it, and to do all in my power to contribute to the interest of our organization; no stone shall be left unturned that may promote the welfare of the American Railway Master Mechanics' Association. Gentlemen, I thank you. [Applause.]

Mr. Philbrick, Maine Central Railroad—Mr. President, I have a thought that I feel sorry some one else has not expressed, for I feel that it is the thought of a great many. I have waited for some one else to express it, but it has not been done. It is just this: Mr. Dodge, our retiring Secretary, saw fit to resign that position, and a vote of thanks has been given him, all of which was too much of a business form. I wish to express more than that. I merely suggest this to bring the matter before the Association. I really appreciate the work Mr. Dodge has done. It will be difficult to find a man so exceedingly well fitted for the work as he is. I wish some one who can express the thought as I feel it, and as I am sure the Association feels it, would do so. I only suggest the matter for your consideration.

The President—I think it highly proper that we have a committee appointed to draft resolutions of thanks to the citizens of Louisville for their kindness to us; to the different railroads, etc., for favors, and before that committee the matter suggested by Mr. Philbrick would come.

Mr. Burke, Memphis & Charleston Railroad, moved that the Chair appoint a committee of three to act in that capacity; which was adopted, and the following committee appointed: Morris Sellers, Des Moines Valley Railroad; Philbrick, Maine Central Railroad, and McFarland, Richmond, Danville & Piedmont Railroad.

The Committee on Finance then made the following report:

REPORT OF FINANCE COMMITTEE.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee have examined the accounts, bills and vouchers of the Treasurer, and find them correct; all of which have been approved and filed.

H. M. BRITTON, }
White Water Valley Railroad, }
J. SEDGWICK, } Committee.
Lake Shore & Michigan Southern Railway, }
W. F. SMITH, }
Cleveland, Columbus, Cincinnati &
Indianapolis Railroad, }
J. M. BOON, }

Pittsburgh, Fort Wayne & Chicago Railway,

On motion, the report was received.

The Secretary presented from Mr. Grant a proposition to admit a certain number of scientific men to an honorary membership in the Association.

Mr. Burke moved that a committee of three be appointed by the Chair to examine the by-laws and report some plan for the admission of such members. Adopted.

The Chair then appointed the following committee: Messrs. Grant, Rockford, Rock Island & St. Louis Railroad; Burke, Memphis & Charleston Railroad; Towne, Hannibal & St. Joseph Railroad.

On motion, the General Supervisory Committee was continued for another year.

The Committee on Assessment then presented the following:

LOUISVILLE, Ky., September 14, 1871.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee, to whom was referred the

subject of assessment, respectfully beg leave to report that they find it necessary to make an assessment of ten dollars on each member to defray the expenses of the Association for the ensuing year.

J. W. PHILBRICK,
Maine Central Railroad,
W. McALLISTER,
West Jersey Railroad,
H. A. TOWNE,
Hannibal & St. Joseph Railroad.

Committee.

Mr. Hayes, Illinois Central Railroad, moved that the Committee on Assessment be instructed to proceed to collect the amount. Adopted.

Mr. Hayes, Illinois Central Railroad, moved that the Association pay Mr. Dodge five hundred dollars for the last year's service. Unanimously adopted.

The committee appointed to report some plan for the admission of associate members of a certain number of scientific gentlemen, then made the following report, which was adopted:

To the American Railway Master Mechanics' Association:
GENTLEMEN: Your Committee, to whom was referred the subject of the admission of associate members, beg leave to suggest the following amendment to Article IV., Section 1, of the Constitution:

Civil and mechanical engineers and others whose qualifications and experience might be valuable to the Association, may become associate members by being recommended by three active members. Their names shall then be referred to a committee, who shall report to the Association on their fitness for such membership. Applicants to be elected by ballot at any regular meeting of the Association, and five dissenting votes shall reject the applicant. The number of associate members shall not exceed twenty. Associate members shall be entitled to all the privileges of active members, except that of voting.

R. D. GRANT,
M. BURKE,
H. A. TOWNE,

Committee.

Report received and committee discharged

The following gentlemen were nominated associate members:
M. N. Forney Railroad Gazette.
Alexander L. Holley Troy, N. Y.
W. W. Evans New York.
Gordon H. Nott Boston.
Wm. B. Bement Philadelphia.
Coleman Sellers Philadelphia.
Professor J. Lawrence Smith Louisville.

On motion, L. H. Waugh, Kansas Pacific Railway; W. H. Griggs, New York & Oswego Midland Railroad; Charles Graham, L. & B. Railroad; George W. Gloss, A. V. Railroad; C. O. Marston, Indianapolis, Cincinnati & Lafayette Railroad, were appointed a committee to investigate the above applications.

The committee on assessment then announced a cash collection of \$782, with an assessment of \$1,007 to be collected.

Report received and committee discharged.

Mr. Ham, New York Central Railroad, moved that the new Secretary be instructed to correspond with delinquent members and request them to pay their assessment.

Mr. Burke, Memphis & Charleston Railroad, moved to amend by substituting the Treasurer for the Secretary. Adopted.

Mr. Wells, Jeffersonville, Madison & Indianapolis Railroad, suggested that action on the delinquents be laid over till the May meeting.

Mr. Burke, Memphis & Charleston Railroad, moved that the Treasurer and Secretary be instructed to report at the next meeting the names of all delinquents. Adopted.

The Committee on Resolutions then made the following report:

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee, appointed to draft resolutions expressive of the appreciation of the convention for the uniform courtesies, invitations and entertainments which have been extended to the Association, beg leave to report:

That we fully appreciate the generous efforts of our friends to make this our fourth annual convention as pleasant and attractive in all its friendly and social relations as possible, and recognizing this we desire to present our hearty and cordial acknowledgments to the following gentlemen:

To Colonel Johnson, proprietor of the Galt House, for the uniform courtesy, unremitting attention, and unbounded hospitality while guests of his excellent and well-ordered establishment.

To Horace Scott, Esq., General Superintendent Jeffersonville, Madison & Indianapolis Railroad, for the use of an excursion train to visit the manufacturing establishments of New Albany and Jeffersonville, and for his careful personal supervision of the safety of his guests, by accompanying them over the road. We fully appreciate his many favors, and hope we may be always as fortunate in meeting one so well able to entertain and interest us, as much by his practical experience as by his eloquence and good feeling.

To Samuel Gill, Esq., General Superintendent Louisville, Cincinnati & Lexington Railroad, for generously tendering the Association the use of a train to the fair grounds, and for his cordial amenity, extended to the individual members of the Association.

To Thatcher Perkins, Esq., Superintendent of motive power of the Louisville & Nashville Railroad, for the offer of a train to visit the famous Mammoth Cave of Kentucky, and for his hearty efforts in every way to make our present meeting a success in all respects. We fully appreciate his attention in explaining to us the multifarious details of the well-ordered and completely-arranged departments connected with the mechanical department on the great road over which he has the honor to preside with acknowledged eminent skill, the result of a life-long effort and well-trained experience.

To the proprietor of the Glass Works and the proprietor of the Steam Forge, of New Albany; and last, though not least, to the Ohio Falls Car Company, of Jeffersonville, where the Association was the recipient of an elegant entertainment, which added not a little to the termination of a day filled with much that was interesting and pleasant to be remembered.

To A. N. Kellogg, Esq., proprietor of the RAILROAD GAZETTE, for the generous use of his columns in advertising the business of the Association; and to J. H. Coyne, Esq., for copies of his well-compiled "Railway Official Manual."

Your Committee, in concluding their labor, desire to express to our late Secretary, L. P. Dodge, Esq., our appreciation of his work in behalf of the Association, during the long term of his official identity, and we regret that other and more important duties have decided him to pursue other walks of usefulness, in which, we trust, his success may be as unbounded as his abilities should insure.

To the press of Louisville we wish also to express our grateful acknowledgments for the interest they have manifested in our Association, and the able and careful manner in which they have reported its proceedings.

To Lemuel Hyatt, Esq., President Louisville and Jefferson County Agricultural Association, and to A. T. Goshorn, Esq., President Cincinnati Industrial Exposition, for kind invitation, and regret that want of time obliges us to decline their kind invitation.

MORRIS SELLERS,
Westinghouse Air Brake Co.,
J. W. PHILBRICK,
Maine Central Railroad,
JOHN McFARLAND,
Richmond & Danville Railroad,

Committee.

On motion, the resolutions were unanimously adopted.

Mr. Burke, Memphis & Charleston Railroad, moved that the Secretary be requested to furnish a copy of the resolutions to the parties named in the report. Adopted.

The Committee on Application for Associate Membership then made the following report, which was received:

LOUISVILLE, September 14, 1871.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee, to whom was referred the names of M. N. Forney and others, as suitable persons to become Associate Members of this Association, respectfully beg leave to report favorably.

W. H. GRIGGS,
New York & Oswego Midland Railroad,
CHAS. GRAHAM,
Lackawanna & Bloomsburg Railroad,
GEO. W. GLOSS,
Allegheny Valley Railroad,
C. O. MARSTON,
Indianapolis, Cincinnati & Lafayette R. R.

Committee.

On motion, the report was received and Committee discharged.

The President—The next business in order will be balloting for candidates to become associate members.

The following named gentlemen were appointed tellers: Philbrick, Maine Central Railroad, and Morris Sellers, late Des Moines Valley Railroad.

A ballot was then had, which resulted in the unanimous election of:

M. N. Forney Railroad Gazette.
Alexander L. Holley Troy, N. Y.
W. W. Evans New York.
Gordon H. Nott Boston.
Wm. B. Bement Philadelphia.
Coleman Sellers Philadelphia.
Professor J. Lawrence Smith Louisville.

Mr. L. H. Sellers moved that the Secretary be requested to notify them, and request their attendance at the next meeting of the Association.

Mr. Burke, Memphis & Charleston Railroad, moved to amend by giving the additional notice that a fee of \$11 should accompany the application. Amendment accepted.

Mr. Hayes, Illinois Central Railroad—My idea has been that these gentlemen may not want to become members, and it seems to me it would be a little too much to request a fee. Would it not be enough to notify them of the election, and then if they meet us in May they will pay up.

The President—They can not sign the constitution till then.

Mr. Wells, Jeffersonville, Madison & Indianapolis Railroad—Many of them have been proposed by their friends, perhaps without their knowledge, and it would not look right to notify them of their election and request a fee. If they had made voluntary application it would have been different. If they meet with us in May we can then ask them to pay as the rest of us have done.

The President—Would not that be getting them under false pretences. [Laughter.]

Mr. Burke, Memphis & Charleston Railroad—It appears to me that they should come in as others do. That was the intention of the Committee. If their friends have presented their names without consulting them they have not done right. They should have been informed of the conditions. I can see no impropriety in requesting them to pay the regular fee of the Association.

Mr. Wells, Jeffersonville, Madison & Indianapolis Railroad—I have no objections to applying that rule to those who made application, but to apply it to the others would not be right. It is perfectly right that any one voluntarily seeking admission should pay as much as any of the rest of us, but with those presented by their friends it is different.

Mr. Ham, New York Central Railroad—There is no doubt in my mind that every one presented will attend. I speak understandingly of those I recommended.

Mr. Burke, Memphis & Charleston Railroad, withdrew his motion.

Mr. Setchell, Little Miami Railroad, moved as a substitute that the Secretary be requested to notify associate members of their election to membership, and state that if they desire to avail themselves of the privilege they should remit an initiation fee of one dollar and an assessment of ten.

Mr. Philbrick, Little Miami Railroad—I suggest that they be notified that they have been elected, and let them come in under the rules. I see no reason why they should be notified of their indebtedness to the Association. The by-laws prescribe the manner in which they shall become members. They have been duly elected as prescribed by the by-laws.

Mr. Hayes, Illinois Central Railroad—I suppose the constitution and by-laws do not make it obligatory upon anybody to become a member. It is entirely voluntary upon their part. I am willing to pay the assessment of any one I have proposed, but I am opposed to sending any man a notice that he has been elected a member of this Association, and must come forward and pay. I think it is beneath the dignity of the Association. I am ready to stand up and pay Mr. Forney's bill, for I know that he is an honorable gentleman and will pay me back. It is a perfectly voluntary act and should be held so.

Mr. Setchell, Little Miami Railroad—I would like to ask Mr. Hayes if it would be discourteous to the gentlemen to notify them of their election, and say if they desire to become members they are requested to remit the fee in accordance with our by-laws.

Mr. Hayes, Illinois Central Railroad—I certainly oppose that part of it. I have no objections to notifying them that they have been elected members of the Association, but so far as collecting fees are concerned we have no right to do so till they have signed the constitution.

Mr. Setchell, Little Miami Railroad—Does the gentleman know of any Association anywhere where they admit members without a fee when one is expected?

Mr. Hayes, Illinois Central Railroad—We do not refuse to take a fee, but these gentlemen are not aware that they have been proposed.

Mr. Setchell, Little Miami Railroad—Then we have been too fast.

Mr. Hayes, Illinois Central Railroad—I admit it. I am ready to pay for the one I proposed. These gentlemen should have been consulted. We have got ahead of our track entirely. I have no doubt all those persons would desire to come in, but we don't know that; therefore, I would simply say that they have been elected, and when they meet us in May they will pay their assessments.

Mr. Burke, Memphis & Charleston Railroad—Who understand the assessment is for this year. Next year it will be twenty-one dollars.

Mr. Hayes, Illinois Central Railroad—I have just paid my assessment for last year, not for this year. These gentlemen are just elected for the present year; consequently they are not assessable for the present year.

The President—Then we have no right to charge the gentlemen but one dollar each.

Mr. Ham, New York Central Railroad—I have recommended two men, and I am ready to sign the constitution and pay the dues.

Mr. Skidmore, Louisville, Cincinnati & Lexington Railroad, inquired if a man could be a member of the Association before he paid his initiation fee and assessments.

Mr. Burke, Memphis & Charleston Railroad—I think Mr. Hayes is mistaken. I became a member of the Association

last year at Philadelphia. I paid ten dollars then and ten to-day. If Mr. Hayes is right, I should have part of it returned to me.

Mr. Hayes, Illinois Central Railroad—Mr. Burke met with us last year, and paid his ten dollars. He has met with us this year and paid for this year. He participated in the proceedings of the Association last year and he has participated in the proceedings this year; consequently he has paid for two years. These gentlemen have never been present or participated at all.

Mr. Wells, Jeffersonville, Madison & Indianapolis Railroad—It seems to me that the whole difficulty arises from a want of the seventy-seven dollars. There is no difference among us except in regard to the paying of eleven dollars apiece by these seven men. I can see no pressing reason why they should pay now, unless they are here to know of our action, and feel like doing so. It looks like small business to me.

Mr. Setchell, Little Miami Railroad—Does not my motion provide for that?

Mr. Wells, Jeffersonville, Madison & Indianapolis Railroad—It is very well, but puts the matter in an unpleasant light. You say they become members by paying so much money. That puts it in a light different to that in which the man sees it who pays voluntarily.

Mr. Burke, Memphis & Charleston Railroad, asked for information as to the provision of the by-laws.

The President then read Section 2, Article IV.:

ARTICLE IV.

SECTION 2. All members of the Association will be liable for such dues as may be necessary to assess to defray the expenses of the Association.

Mr. Philbrick, Maine Central Railroad—I see no reasons for making an exception in this case. These men should come in if they desire to do so on exactly the same footing as others. You have never notified any man before. When a man comes in he pays something; and when you notify these men that they must pay, it strikes me you say we care not so much for you as your money, and that is, to some degree, odious. Mr. Setchell's motion was then put and carried.

Mr. Grant, Rockford, Rock Island & St. Louis Railroad—I think there is one thing that has been lost sight of. That is a notice of the decease of a member of the Association, Mr. Otis Freeman, of the Toledo, Wabash & Western Railroad.

The President—I was not very well acquainted with Mr. Freeman, but I understand he was a good mechanic and a noble-hearted gentleman. I would suggest the propriety of appointing a committee to draft resolutions relative to his death.

Mr. Wiggins, Boston, Hartford & Erie Railroad, moved the appointment of such a committee.

Which was adopted, and the following committee appointed: Messrs. Wiggins, Boston, Hartford & Erie Railroad; Boon, Pittsburgh, Fort Wayne & Chicago Railway; Wells, Jeffersonville, Madison & Indianapolis Railroad.

Mr. Philbrick, Maine Central Railroad—I have something to say bearing upon the subject just disposed of. Those men who have been elected associate members of the Association are peculiarly fitted to give us something out of our usual line. We are all practical men. We can make anything needed, but cannot talk much. You have men there better fitted than the majority of us for talking. I propose that we have no "dead-heads" among us. I would have a committee to invite those men to prepare, in the course of the year, a paper to be read at our next meeting. Let the subject be anything they may select relative to the Association. And as we have been so particular about pay, I will add that they be paid for it. [Laughter.]

Mr. Burke, Memphis & Charleston Railroad—I move that the President, Vice-President and Secretary be appointed a committee of three to request the preparation of such an article to be read at our next meeting. Adopted.

Mr. Setchell, Little Miami Railroad, inquired if a Committee on Arrangements for the next annual session had been appointed.

The President said there had not.

Mr. Setchell—I move the appointment of a committee of three for that purpose.

The motion was adopted.

Mr. L. H. Sellers moved that the Secretary be requested to notify each committee of their appointment at his earliest convenience.

Mr. Burke, Memphis & Charleston Railroad, inquired whether or not any report had been received from the committee appointed to correspond with railway officers for an interchange of passes to master mechanics.

The President—it is contained in the published report of last year. They were instructed to prepare a circular, which may be found there, but were not expected to make any report.

Mr. Dodge—I would like to say something in behalf of my successor in calling the attention of the Association to the necessity of a more general reply to circulars sent out. At the last annual session a resolution was adopted requesting the Secretary to prepare a book containing the railroad and post-office address of each member, and the members were to furnish data. I procured the book and received two replies, one of which was from friend Britton, sent, perhaps, more as a joke than anything else. It will require a most cordial co-operation on the part of members to enable Mr. Setchell to accomplish his work in the time he is required to do it. I call attention to this because I know it is essential. I have no doubt members thought they would bear the matter referred to in mind during the year. When the convention is in session they are earnestly desirous of bringing the business to a successful conclusion, but when they get home their official duties require a great deal of time; and when a circular is received they postpone it till a more convenient time, and the result is it is neglected.

Mr. Burke, Memphis & Charleston Railroad, moved that the chairman of the various committees be instructed to prepare their circulars and forward copies to the Secretary, and that he be instructed to have them printed and issued, with a request that the answers be forwarded to the chairman of the committees. Adopted.

Mr. Johann moved that the chairman be directed to forward their circulars to the Secretary by the 1st of November, so that the answers might be returned by the 1st of January. Adopted.

Mr. Towne, Hannibal & St. Joseph Railroad, moved that the resolutions being prepared by the committee appointed to take under consideration the death of Otis Freeman be taken as the sense of the convention and embodied in the minutes. Adopted.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your committee appointed to draft resolutions expressive of the deep and heartfelt regret we feel in the loss, by death, of one of our most useful members, Mr. Otis T. Freeman, late Master Mechanic of the Lafayette Division of the Toledo, Wabash & Western Railway, beg leave to submit the following:

Resolved, That in the death of Mr. Freeman the Association has lost one of its most worthy members, in whose experience as a mechanic we relied greatly for assistance in our deliberations, and whose upright integrity and social virtues endeared him to us all—one whom to know was to respect and love.

Resolved, That the Association extend to his bereaved family our heartfelt sympathy in this their great affliction. And be it further

Resolved, That the Secretary be instructed to forward a copy of

these resolutions to Mrs. Freeman, and also publish them in our annual report.

R. WELLS,
Jeffersonville, Madison & Indianapolis
Railroad,
J. E. WIGGINS,
Boston, Hartford & Erie Railroad,
J. M. BOON,
Pittsburgh, Ft. Wayne & Chi. Railway.

Committee.

The President—The subjects for discussion for the ensuing year, and the committees thereon will be as follows:
Boilers and Boiler Material.—Hayes, Illinois Central Railway; Jauriet, Chicago, Burlington & Quincy Railway; Lamb, Des Moines Valley Railway.

The Relative Merits of the Straight and "Wagon-Top" Locomotive Boilers.—Philbrick, Maine Central Railway; Griggs, New York & Oswego Midland Railway; Kinsey, Lehigh Valley Railway.

Boiler Incrustation.—Towne, Hannibal & St. Joseph Railway; Boon, Pittsburgh, Fort Wayne & Chicago Railway; Johann, Missouri Pacific Railway.

Safety Valves.—Robinet, South Side Railway; James McFarland, Mobile & Montgomery Railway; D. W. Haynes, Northeastern Railway.

Lap and Lead of Slide Valves and to Discuss the Theory of Eccentric and General Principle of Valve Motion.—Clark, Lehigh Valley Railway; Garrett, Pennsylvania Railway; Cook, Danforth & Cook Locomotive Works.

Steel Tire.—Lauder, Northern Railway; Studley, Cheshire Railway; Griggs, Worcester & Northern Railway.

Best Method of Securing Driving and Truck Brasses.—Boon, Pittsburgh, Fort Wayne & Chicago Railway; Young, Cleveland, Columbus, Cincinnati & Indianapolis Railway; Tier, Lake Shore & Michigan Southern Railway.

Best Method of Constructing Tender Trucks.—Rennie, Pittsburgh & Cornwallville Railway; Cummings, Pittsburgh, Fort Wayne & Chicago Railway; Shaver, Pennsylvania Railway.

Is there any Material or Device for Packing Stuffing Boxes more Economical than Hemp?—L. H. SELLARS, Memphis & Charleston Railway; T. Bissett, Memphis & Charleston Railway; Eastman, Nashville & Chattanooga Railway.

Application of Compress Brakes.—Mitchell, Lehigh Valley Railway; Graham, Lackawanna & Bloomsburg Railway; Street, Pennsylvania Railway.

Relative Merits of the Narrow and Broad-Gauge Railroads.—Burke, Memphis & Charleston Railway; Waugh, Kansas Pacific Railway; Philbrick, Maine Central Railway.

Comparative Performance and Cost of Operation of Eight and Ten-wheel Engines for Freight Service.—Jordan, Cumberland & Pennsylvania Railway; Hofecker, Lehigh Valley Railway; Graham, Lackawanna & Bloomsburg Railway.

Comparative Performance and Cost of Operation of Ten-wheel Engines with Six Drivers Coupled and Eight-wheel Engines with Four Drivers Coupled.—Ham, New York Central Railway; Hill, Erie Railway; Sedgley, Lake Shore & Michigan Southern Railway.

Uniform System of Computing Mileage of Engines Doing Switching Service.—Wells, Jeffersonville, Madison & Indianapolis Railway; Palmer, Pittsburgh, Cincinnati & St. Louis Railway; Setchell, Little Miami Railway.

Uniform System of Examination for Promotion of Locomotive Firemen.—Chapman, Cleveland & Pittsburgh Railway; Smith, Cleveland, Columbus, Cincinnati & Indianapolis Railway; Sedgley, Lake Shore & Michigan Southern Railway.

Advisability of Establishing Different Grades of Locomotive Engineers, according to Length of Service, Character, etc.—Referred to Committee on Promotion of Firemen.

Finance.—Britton, White Water Valley Railway; Sedgley, Lake Shore & Michigan Southern Railway; M. Sellers, Westinghouse Air Brake Company; Boon, Pittsburgh, Fort Wayne & Chicago Railway.

Printing.—Britton, White Water Valley Railway; Chapman, Cleveland & Pittsburgh Railway; Setchell, Little Miami Railway.

Arrangements for Next Annual Meeting.—John Thompson, Eastern Railway; F. A. Wait, Boston & Maine Railway; George A. Coolidge, Fitchburg Railway.

General Supervisory Committee.—Britton, White Water Valley Railway; Chapman, Cleveland & Pittsburgh Railway; Pendleton, Seaboard & Roanoke Railway; Setchell, Little Miami Railway.

The Master Mechanics' Association's Circulars of Inquiry.

The various committees appointed to prepare reports for the next meeting of the American Railway Master Mechanics' Association have, up to this time, prepared the following circulars of inquiry, one of which is addressed to each master mechanic. The remainder we will publish as soon as they are prepared:

BOILER INCRUSTATIONS.

The undersigned, a committee appointed by the American Railway Master Mechanics Association, at their convention, held at Louisville, Sept. 12, 13 and 14, 1871, on the "Best Mode of Preventing the Formation of Lime and other Incrustations in Boilers," would ask your opinion and answers to the following interrogatories. Please state your opinion without reserve, as your experience, however limited, may be of great importance:

1. What kind of water is mostly used on your road? Is it taken from wells, springs, streams, or is it surface water? Is it lime? Or what are its impurities?
2. How many miles, and how long do you consider it economy to run flues before taking them out to clean off scale, etc.?
3. How soon do you find that the impurities in water eat out the bottom of your boilers, so as to require new sheets? After how many years' service, or miles run?
4. What have you found best to remove scales after they have formed in boilers?
5. Have you ever used any batteries, powders, fluids, or any other preparation that would prevent the formation of scale, lime, or other incrustations in boilers, and what do you consider best?
6. Do you know of any preparation of powders, fluids, or batteries, that will prevent the formation of lime or scale that does not or will not injure the boiler?
7. Do you consider the use of a suitable filter, arranged in the top (or otherwise) of water tubs, on the line of your road, practicable as a means of arresting mud and other floating impurities?
8. Do you have any trouble from deposit of sediment on crown sheets? If so, what is the nature of it, and what height from crown sheet to underside of crown bars do you find gives the best results in preventing the accumulations of sediment?
- 9th. What, in your opinion, is the best method of keeping locomotive boilers free from mud and scale?

Respectfully yours,

H. A. TOWNE,
Hannibal & St. Joseph Railroad,
J. JOHANN,
Pacific Railroad of Missouri,
J. M. BOON,
Pittsburgh, Fort Wayne & Chicago Railway.

Committee.

Please direct your reply to H. A. TOWNE, Chairman of Committee on Boiler Incrustations, Hannibal, Mo.

PURIFYING WATER FOR LOCOMOTIVES.

DEAR SIR: At the last annual meeting of the American Railway Master Mechanics' Association, the report of the Committee on Boiler Incrustations demonstrated very clearly that by far the largest repairs on locomotive boilers is caused by the use of impure water. In some sections of the country the water is impregnated with lime and other minerals that attack the iron along the seams, around rivet and bolt holes, and wherever the grain of the iron has been disturbed in the process of manufacture, and frequently making it necessary to renew certain portions of the boiler in two or three years, and flues in a year or eighteen months. While in localities where the water is pure or free from these injurious properties, we have reports of boilers lasting, in good condition, from twenty to thirty-eight years. This being the result of using pure water, it is easy to see what a vast amount of money, to say nothing of the loss of the use of machinery, would be saved to railroad companies if all could procure good water.

With this view the secretary was instructed to correspond with superintendents and master mechanics in regard to purifying the water before it is allowed to enter the boiler, and report at the next annual meeting of the Association. And in order to make this as full and practical as possible, I respectfully ask the benefit of your experience and opinions.

1. Is it, in your opinion, practicable to so use the exhaust and waste steam, at water stations where steam-power is used for pumping, to heat the water to such an extent as to precipitate the lime and other impurities that are injurious to boilers, so as to render it practically pure?
2. If such a result could be obtained, would not the expense saved in fuel and repairs of boilers justify the adoption of such a practice, even at an increased expense of pumping power?
3. Have you had any experience in heating the feed-water of boilers for the purpose above-named, and if so, with what result?
4. Can you suggest any device for heating the water at water stations that would not be expensive, and, at the same time, accomplish the desired object?

Please give me all the information you may have on the subject, and oblige, yours, very respectfully,

J. H. SETCHEL, Secretary,
Cincinnati.

SLIDE VALVES AND VALVE GEARING.

The undersigned committee, to whom was referred the subject of "valves and valve gear," at the last annual convention of the American Railway Master Mechanics' Association, would call your attention to the questions hereunto annexed, and urgently request your early consideration and reply to the same, as regards efficiency and economy of fuel and repairs:

With Locomotives Running Fast Passenger Trains.

1. What amount of outside lap do you use?
2. What amount of inside lap do you use?
3. What amount of travel of valve do you use?
4. What amount of lead in full gear do you use?
5. What amount of lead at half gear do you use?

With Locomotives Running Passenger Accommodation Trains.

1. What amount of outside lap do you use?
2. What amount of inside lap do you use?
3. What amount of travel of valve do you use?
4. What amount of lead in full gear do you use?
5. What amount of lead at half gear do you use?

With Locomotives Running Heavy Freight Trains.

1. What amount of outside lap do you use?
2. What amount of inside lap do you use?
3. What amount of travel of valve do you use?
4. What amount of lead in full gear do you use?
5. What amount of lead at half gear do you use?

Balance Valves.

1. Have you used any balance valves? If so,
2. Whose, and of what description?

Valves Working on Rollers.

1. Have you used any valves of this description?
2. Do you use cages for the rollers?

Do not confine yourself simply to answering questions, but please give the results of any experiments you may have made with valves and valve gear.

DAVID CLARK,
Lehigh Valley Railroad
H. D. GARRETT,
Pennsylvania Railroad
J. COOK,
Danforth & Cook Locomotive Works.

Committee.

Please direct your replies to DAVID CLARK, Hazelton, Penn.

BEST METHOD OF SECURING DRIVING AND TRUCK BRASSES.

DEAR SIR: The committee appointed by the American Railway Master Mechanics' Association to report on "The Best Method of Securing Driving and Truck Brasses," would respectfully ask your opinion and answers to the following questions. Please state your opinion without reserve as early as possible—not later than March 1, 1872:

1. In your opinion, which is the best method of securing driving and truck brasses?
2. Is it advisable to use babbitt metal, and if so which is the best method of inserting it, to insure even wear upon the journal?
3. What, in your opinion, is the best shape for driving and truck brasses; octagon, half-round or gibs inserted in the cast iron?
4. What is the highest mileage you have known a half-round brass to run before it becomes loose? The same with regard to any other kind you have ever used?

JAMES M. BOON,
Pittsburgh, Fort Wayne & Chicago,
Railway,
L. S. YOUNG,
Cleveland, Columbus, Cincinnati &
Indianapolis Railroad,
G. H. TIER,
Lake Shore & Michigan Southern
Railway.

Committee.

Please direct your reply to JAMES M. BOON, Fort Wayne, Ind.

IS THERE ANY MATERIAL OR DEVICE FOR PACKING STUFFING-BOXES MORE ECONOMICAL THAN HEMP?

DEAR SIR: Your committee, appointed at the last an-

nual session of the American Railway Master Mechanics' Association to investigate and report on the question, "Is there any material or device for packing stuffing-boxes more economical than hemp?" respectfully beg leave to ask your opinion and experience in answer to the following:

1. Is there, in your opinion, any material or device for packing stuffing boxes more economical than hemp?
2. Have you ever used metallic packing? If so, what kind, and with what result?

Please give any and all information you may think of value or interest to the committee, and oblige,

Yours truly,

L. H. SELLARS,
Memphis & Charleston Railroad,
F. BISSETT,
Memphis & Louisville Railroad,
J. U. EASTMAN,
Nashville & Chattanooga Railroad.

Committee.

Please address your replies to L. H. SELLARS, Master Mechanic, Memphis & Charleston Railroad, Huntsville, Ala.

NARROW AND BROAD-GAUGE RAILWAYS.

DEAR SIR: The undersigned committee were appointed at the last annual meeting of the American Railway Master Mechanics' Association to investigate and report upon the "Relative Merits of the Narrow-Gauge Railway as Compared with the Present System," and with the view of making this report as complete as possible, we ask your opinion as follows:

1. Have you had any experience in the operations of narrow-gauge railways?
2. What width of gauge would you recommend, 2 ft., 2 ft. 6 in., 3 ft., or 3 ft. 6 in.?
3. What weight and style of engine, in your opinion, is best adapted to narrow-gauge roads?
4. What width of car-body would you recommend for 24-in., 30-in., 36-in., or 42-in. gauge?
5. What kind of truck for cars as above, and what kind of springs?
6. Will the width of gauge, as given above, accommodate the business of the country?
7. What advantage does a narrow-gauge engine possess over a properly constructed engine of 4 ft. 8 in. gauge?
8. Does the capacity of engines and cars necessarily decrease with their weight?
9. What, in your opinion, would be the difference in cost of equipping, say a 3 ft. 6 in. gauge road with engines and cars, as compared with 4 ft. 8 in. gauge?
10. What is the cost of operating a narrow-gauge road compared with 4 ft. 8 in. gauge?
11. Can the results obtained by the narrow-gauge system be accomplished by reducing the present weight of rolling stock on gauges of 4 ft. 8 in.?

Any further information that you may be pleased to communicate will be thankfully received and respectfully used. Your committee desire to submit as full a report as possible.

Yours, respectfully,

M. BURKE,
Master Mechanic, Memphis &
Charleston Railroad,
LEE H. WAUGH,
Superintendent Machinery, Kan-
sas Pacific Railway,
S. L. PHILBRICK,
Master Mechanic, Leavenworth,
Lawrence & Galveston Railroad.

Committee.

Please address your replies to M. BURKE, Memphis, Tenn.

COMPARATIVE PERFORMANCE AND COST OF OPERATIONS OF EIGHT-WHEEL ENGINES WITH SIX DRIVERS COUPLED, AND TEN-WHEEL ENGINES WITH SIX DRIVERS COUPLED.

DEAR SIR—The undersigned, a committee of the American Railway Master Mechanics' Association, appointed September 14, 1871, on "Comparative Cost and Performance of Eight-wheel Engines with Six Drivers Coupled, and Ten-wheel Engines with Six Drivers Coupled," respectfully ask a reply to the following questions at your earliest convenience. Also any other information that, in your opinion, may be useful to them in making up their report:

1. Have you had any experience with ten-wheel engines, with four-wheel truck and six drivers connected?
2. Have you had any experience with eight-wheel engines, with two-wheel truck and six drivers connected?
3. Please give your opinion of the merits of each class of engines named, and also difference in cost of repairs?
4. In your opinion, which of the two classes of engines named is the best for all kinds of freight service?
5. What is the difference in number of cars hauled between these three classes of engines on your road: ten-wheel engines, with four-wheel truck; eight-wheel engines, with two-wheel truck; eight-wheel engines, with four-wheel truck?
6. Please give gross weight of each class of engine on drivers and truck: dimensions of cylinder and driving wheel: diameter and length of boiler: length and depth of fire-box: and the cost per mile run for each class of engine?

C. T. HAM,
Superintendent of Machinery, New York
Central Railroad,
E. O. HILL,
Superintendent of Machinery, Erie Rail-
way,
J. SEDGLEY,
Superintendent of Machinery, Lake Shore
& Michigan Southern Railway.

Committee.

Please address your replies to C. T. HAM, Sup't Machinery, New York Central Railroad, Albany, N. Y. Eleven committees have their circulars yet to issue.

—A project for uniting the Black and Caspian Seas by a canal, according to the plan of Capt. Blum, is engaging the attention of the Russian Government. The cost is estimated at about \$50,000,000.

—The Berlin Official *Reichs-Anzeiger* states that during the present year 726 locomotives, 845 passenger carriages, and 17,862 goods wagons, have been built or ordered for the Prussian railroads. Of these, 265 locomotives, 386 carriages, and 7,375 wagons were finished and delivered over by the end of September; 197 engines, 159 carriages, and 5,262 wagons are to be ready by the end of the year; and 264 locomotives, 300 carriages and 5,205 wagons, that have been contracted for, are to be completed by the end of March next year. These additions to the rolling stock in Prussia represent a capital of thirty million thalers, or nearly \$23,000,000 American currency.



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Editorial Announcements.

Address.—The RAILROAD GAZETTE will be printed for the present in New York; our printing house in Chicago having been destroyed. All communications, therefore, whether editorial or business, should be directed to the New York office. The proprietor will receive subscriptions and advertisements at his office in Chicago, Nos. 63 and 65 South Canal street, but letters should be addressed to New York.

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

"THE HISTORY OF THE FIRST LOCOMOTIVES IN AMERICA."

It is difficult for those who are familiar with the extent of the present railroad system in this country to realize that it was inaugurated by persons who are still living, that the present President of the American Society of Civil Engineers ran the first locomotive which was ever put into operation in this country, and that the builder of the first American locomotive can be seen almost daily on the streets of New York. Nevertheless, such is the fact. The book whose title we have made the heading of this article gives what has never been written before—an authentic history of early locomotive engineering on this side of the Atlantic. Nearly all the books and treatises on locomotive engines have been the work of European authors, so that most of the historical matter they contained came through European channels, chiefly because the sources of getting information from this country were not accessible to the writers. It came, for example, almost like a new revelation to some of our European contemporaries when the RAILROAD GAZETTE about a year ago rescued almost from oblivion an illustration and description of a double-truck locomotive, built for the South Carolina Railroad in 1831, from the designs and under the direction of Mr. Horatio Allen. There are other similar "bits of history" scattered over the country; some resting only in the memories of men still living, while others may be found in documents scattered here and there, all of which are liable to loss or destruction unless preserved in some record like the one before us. The book will therefore be read by engineers, and railroad men generally, with great interest, especially as many of the facts contained in it have never before been clearly or authentically presented to the public. It is shown distinctly, and the evidence quoted to prove, that

*The History of the First Locomotive in America, from original documents, and the testimony of living witnesses. By William Brown, No. 31 Beekman street, New York, 1871.

the first locomotive which was ever used in this country was one ordered for the Delaware & Hudson Canal & Railroad Company by John B. Jervis, Esq., and imported from England in 1829. Three engines were ordered at that time. The first which arrived was the "Stourbridge Lion," which was publicly exhibited in New York for some weeks, and was then shipped to Honesdale, Pa., where it made its first trial trip on Saturday, August 8, 1829. Mr. Horatio Allen, then an assistant to John B. Jervis, "stood alone upon the engine, and with his own hand opened the valve that gave the impulse to the driving-wheels that made the first revolution upon a railroad in America." The book contains an engraving of this engine and a number of very interesting letters establishing the above facts, and containing many curious incidents in connection with the introduction of steam on railroads in this country.

The first locomotive built here was a small experimental machine, designed by Mr. Peter Cooper, now of New York, and built at the Mount Clare Works, in Baltimore, during the summer of 1829, for the Baltimore & Ohio Railroad. This engine was a mere experimental machine, the boiler being only about 20 inches in diameter and 5 or 6 feet high. There was but one cylinder, of 3½ inches diameter and 14½ inches stroke. This locomotive was built to show that roads with curves as short as those on the Baltimore & Ohio Railroad could be operated with locomotives. The engine was, however, only an experiment, and was never used for any other purpose.

Mr. Brown's book contains letters from Peter Cooper, Ross Winans and Benjamin H. Latrobe, describing this first engine. There are also two wood engravings from drawings made from memory which represent this machine.

Scattered all through the book many very curious incidents and facts are recited which seem as though they must have occurred in the times of the Pharaohs, instead of within the memory of living men. It is stated, for example, that on the Baltimore & Ohio road the flanges of the wheels were first placed on the outside of the rails, and we remember seeing in some of the early reports of that company some very elaborate calculations, made by the chief engineer at that time, to show that it was best to put the flanges inside of the rails. The book also contains two engravings of "sailing cars"—that is, cars provided with sails and propelled by the wind—and others in which the power of a horse was applied by means of an endless chain "platform," after the manner of threshing machines.

The author also mentions that Mr. Cooper informed him that at the time his experimental engine was built, boiler tubes had never been used, and therefore gun-barrels were employed instead.

The following order, issued by the Board of Directors of the South Carolina Railroad, after an accident which was caused by a misplaced switch, will also excite a smile at the present day:

"Resolved, That in future not over twenty-five passengers be allowed to go on each car. That the locomotive shall not travel at a greater speed when there is attached:
"One car and passengers at fifteen miles an hour.
"Two cars and passengers at twelve miles an hour.
"Three cars and passengers at ten miles an hour.
"And that directions be given to that effect."

In 1830, the Baltimore & Ohio Railroad Company, stimulated by the example of the Liverpool & Manchester Railway in the year previous, offered a premium to the construction of "the best" and "next best" locomotives for doing the work specified in the following advertisement, which appeared in the papers of that day. Every railroad engineer will be struck with the explicitness and clearness with which the stipulations are stated, and the document might be imitated to advantage at the present time by some master mechanics in preparing specifications for locomotives, which, we regret to say, are often drawn up in the loosest manner possible.

"OFFICE OF THE BALTIMORE & OHIO RAILROAD COMPANY, }
"January 4, 1831."

"The Baltimore & Ohio Railroad Company being desirous of obtaining a supply of locomotive engines of American manufacture, adapted to their road, the president and directors hereby give public notice that they will pay the sum of four thousand dollars for the most approved engine, which shall be delivered for trial upon the road on or before the 1st of June, 1831; and they will also pay three thousand five hundred dollars for the engine which shall be adjudged the next best, and be delivered as aforesaid, subject to the following conditions, to wit:

"First—The engine must burn coke or coal, and must consume its own smoke.

"Second—The engine, when in operation, must not exceed three and one-half tons weight, and must, on a level road, be capable of drawing, day by day, fifteen tons, inclusive of the weight of the wagons, fifteen miles per hour. The company to furnish wagons of Winans' construction, the friction of which will not exceed five pounds to the ton.

"Third—In deciding on the relative advantages of the several engines, the company will take into consideration their respective weight, power and durability, and all other things being equal, will adjudge a preference to the engine weighing the least.

"Fourth—The flanges are to run on the inside of the rails. The form of the cone and flanges and the tread of the wheels must be such as are now in use on the road. If the working parts are so connected as to work with the adhesion of all the four wheels, then all the wheels shall be of equal diameter, not to exceed three feet, but if the connection be such as to work with the adhesion of two wheels only, then those two wheels

may have a diameter not exceeding four feet, and the other two wheels shall be two and a half feet in diameter, and shall work with Winans' friction wheels, which last will be furnished upon application to the company. The flanges to be four feet seven and a half inches apart from outside to outside. The wheels to be coupled four feet from centre to centre, in order to suit curves of short radius.

"Fifth—The pressure of steam not to exceed one hundred pounds to the square inch, and, as a less pressure will be preferred, the company in deciding on the advantages of the several engines will take into consideration their relative degrees of pressure. The company will be at liberty to put the boiler, fire-tube, cylinder, etc., to the test of a pressure of water not exceeding three times the pressure of steam intended to be worked, without being answerable for any damage the machine may receive in consequence of such test.

"Sixth—There must be two safety-valves, one of which must be completely out of the reach of the engine-man, and neither of which must be fastened down while the engine is working.

"Seventh—The engine and boiler must be supported on springs, and rest on four wheels, and the height from the ground to the top of the chimney must not exceed twelve feet.

"Eighth—There must be a mercurial gauge affixed to the machine, with an index rod showing the steam pressure above fifty pounds per square inch, and constructed to blow out at one hundred and twenty pounds.

"Ninth—The engines which may appear to offer the greatest advantages will be subjected to the performance of thirty days' regular work on the road; at the end of which time, if they shall have proved durable, and continue to be capable of performing agreeably to their first exhibition, as aforesaid, they will be received and paid for as here stipulated.

"P. E. THOMAS, President.
"N. B.—The railroad company will provide and will furnish a tender, and a supply of water and fuel for trial. Persons desirous of examining the road, or of obtaining more minute information, are invited to address themselves to the president of the company. The least radius of curvature of the road is four hundred feet. Competitors who arrive with their engines before the 1st of June will be allowed to make experiments on the road previous to that day."

The only engine which came up to the requirements of the company was one built at York, Pennsylvania, by Phineas Davis, who was afterwards killed on a trial trip with it. This engine furnished the model for about a dozen others, nearly all of which are still running on the Baltimore & Ohio road at the present time.

Mr. Brown's book also contains an engraving of the double-truck engines built for the South Carolina Railroad by Mr. Horatio Allen, of which we published an engraving in the GAZETTE of March 4, 1871. These engines were not only the first eight-wheeled locomotives which were ever built, but they were the first to which the truck or bogie-system was applied in any form, for which too much credit cannot be awarded to Mr. Allen.

In this connection we think it is but fair to state that there is some discrepancy between a claim made by Mr. John B. Jervis, in a letter published in the book we are reviewing, and some of the testimony given in the Winans' celebrated eight-wheeled car case. In the letter referred to, Mr. Jervis says: "I was the inventor, and put in successful operation the locomotive-truck." At the time of the trial referred to, he gave the following testimony:

"I invented a new plan of frame, with a bearing carriage, for a locomotive engine, in the latter part of the year 1831, for the use of the Mohawk & Hudson Railroad, which was constructed and put on the road in the season of 1832. The trucks in this engine worked perfectly; but the boiler, being intended for anthracite coal, did not do well, and another boiler was made for it. Soon after this, a second engine, with the same plan of wheels and bearing frame, was made and put in operation on the Schenectady & Saratoga Railroad, early in the year 1833. The engine had six wheels; on one pair, the driving wheels rested in the usual way on one end of the frame of the engine; the other end of the engine rested on the frame of a four-wheeled car or truck, so arranged that by means of a centre pin passing through a transverse beam, the upper frame on which the engine rested could follow the guide of the lower frame, without necessarily being parallel with it. * * By this means a long frame for an engine could be and is supported near its end, which provides for the most steady motion of the machine, and by the separate car truck to guide, it passes on curves with all the facility of a short-gauged car."

From this testimony it will be seen that the "new plan of frame" or "bearing carriage" referred to was invented in the latter part of the year 1831, and put on the road in 1832.

Now from the testimony of both Mr. Allen and Mr. C. E. Detmold, given on the same trial, it is clearly shown that the plans for Mr. Allen's double-truck engines were made in the winter of 1830 and 1831, and that the first engine built on these plans "was constructed at the West Point Foundry in 1831; received at Charleston in January, 1832; and put in operation in February, 1832."

The truck, or as our English friends call it, the "bogie," was designed and applied to locomotives by Mr. Allen nearly a year before Mr. Jervis used it. It is true that the latter gentleman employed it in a somewhat different way, and used only one truck on his engines instead of two, as Mr. Allen did, but the latter, and not Mr. Jervis, as he claims, was the first to devise and apply the truck to locomotives. It is true that the peculiar application which Mr. Jervis adopted is the one which has come into general use in this country, and it is only since Mr. Fairlie, with an energy which is almost unparalleled, has resuscitated the use of the double truck that the plan which Mr. Allen adopted has come into use.

We are warned, however, by the length of this article that it is intended as a review and not a history. We have intended only to indicate the scope of the book. It contains much of very great interest to engineers and others, although it has some serious faults. There is much irrelevant matter which can judiciously be skipped. With the exception of the introduction, the first eleven

—The Western Union Telegraph Company has recently completed a line to Brownsville, Texas, on the Rio Grande, thus bringing Mexico within hailing distance.

—The consolidation of the Caledonia and the North British Railway is announced, following close after that of the London & Northwestern and the Lancashire & Yorkshire. These steps are looked upon with favor in England, quite generally, as tending to regularity and economy of operation.

—The Metropolitan Board of Works of London has made the following order as to the hours during which and as to the speed at which locomotives are to pass through the places subject to the jurisdiction of the said board: "No locomotive propelled by steam, or any other than animal power (except a steam fire-engine actually going to or returning from a fire), shall be driven or conducted or be allowed to pass through any street or place within the limits of the jurisdiction of the said Board, between the hours of six o'clock in the morning and ten o'clock in the afternoon of any day, and, with the exception of these hours, locomotives may pass along the streets and places aforesaid. And the Board orders that the speed at which such locomotives shall be driven or pass through any street or place within the limits of the jurisdiction of the Board shall not exceed two miles an hour. This order does not extend to the city of London, or the liberties thereof, and it does not in any way apply to locomotives called steam road rollers, or however they may be named, which are used for making or repairing roads."

—Junction City, Kansas, the northwestern terminus of the Missouri, Kansas & Texas Railway, made a subscription to that company at one time which afterwards it refused to pay. Now, when Junction City is talking of constructing lines northward and offering its connection with the Missouri, Kansas & Texas as an inducement for making the terminus of other roads there, it finds that company not at all ready to encourage its schemes, as may be seen by the following extract from a letter to a committee of citizens of Manhattan, a rival of Junction City, which is seeking aid for rival schemes, written by the President of the Missouri, Kansas & Texas Company:

"You can say to the citizens of your county, on behalf of our company, that so far as it is concerned, we will not, under any circumstance, have any relations or any connection with any railroad coming into Davis County or Junction City, with a view of connecting with our road. Any such road coming into that county we should require them to transship all their freight and passengers."

"The citizens of Junction City and Davis County controlling the organization of that county have behaved to our company in such a dishonest manner and have shown such utter disregard for their promises and obligations, that we are determined to have no more relations with them than we may be compelled to by law. We shall move all of our property out of that county that we can."

—The latest general order of the Russian Minister of Public Works concerning railroads, is that all railroad companies are bound to submit their locomotives, carriages, wagons and trucks to a searching examination every year, and that if the slightest flaw—particularly in the axles—be discovered, they shall be put out of use, as well as all that have traveled over 300,000 versts of railway. Another arrangement of his, is that a book of complaints shall be laid out and open to the public at every station; and the station-master is bound to forward copies of all such complaints on the same day to the railroad authorities, while the inspector of the line has to add his remarks, and state whether there are any reasonable grounds for the complaints made.

—An Oswego brakeman went to sleep in church, and electrified the deacon who took up the collection by remarking, drowsily, "That's all right; I work on this road."

—The Eastern Railroad Company of Massachusetts have paid several of the claims for personal damages arising from the Revere disaster. S. F. Mudge, of Salem, who was seriously injured, has received \$12,000; the executors of Mrs. Shaw, \$4,000, and a man who was cut by broken glass, \$150.

—The St. Paul & Chicago and the Winona and St. Peter railroads enter Winona, Minnesota, on the same right of way, and their tracks for six miles are only 100 feet distant from each other. Recently trains came down on both these roads and arrived at the point of convergence at the same time. The trains then ran a race, which was ended by a plank falling from a car on one train, thrusting through the end of a baggage-car and knocking senseless one of the employes on it. The engineer and conductor of this train, it is reported, have been discharged.

—A railroad bridge on the Burlington & Missouri River Railroad was burned lately, and 56 feet of it entirely destroyed. A construction train was sent to the place immediately, and in two hours and fifty minutes trains passed over the repaired bridge.

—A Kalama letter to the Vancouver Register says that a Steam Navigation Company, of which General Sprague is a leading man, has been organized, and articles of incorporation will be filed at Olympia at once. The company not only contemplates the navigation of the waters of Oregon and Washington Territory, but the entire coast, with ocean and river steamers. The capital is \$1,500,000. It is understood that the Northern Pacific Railroad backs the enterprise.

—The expediency of adopting the cheap railway system has been considered by a Select Committee of the Assembly of Victoria, Australia, the general recommendation being that, while it would have been cheaper to have used a narrower gauge in the first instance, it is doubtful policy to introduce any changes now on the main trunk lines. But the committee strongly recommend that rolling stock for the future should be made on the bogie principle, and that an attempt should be made to see whether one line of rails could not carry on the existing railroads. They recommend that one line should be shut up for the present by way of experiment, and that if

the traffic is not thereby seriously incommoded the rails and sleepers should be taken up and used elsewhere. The estimated saving in maintenance for eight years is £177,194. This is substantially the American system.

—The "Pennsylvania Company" since its organization last spring has ordered 2,500 new box freight cars, most of which are now in use on the Fort Wayne and Panhandle lines. Of these 1,500 were constructed in Eastern Pennsylvania and 1,000 in the Fort Wayne shops. They cost \$625 each and weigh nine tons.

—For strategical reasons it has been decided by the government of the German Empire that a direct line of railway shall be commenced very shortly between Strasburg and Metz. This would considerably shorten the distance for the overland mail between Ostend and Brindisi; as from Ostend it would pass through Brussels, Namur, Luxembourg, Metz, Strasburg and Basel to the foot of the Alps, and, when the Gothard Railway is completed, through the chain of mountains to Italy. From Basel to Luxembourg the line for the whole way would be in the hands of the German Empire.

—To relieve suffering caused by the failure of the potato crop in many parts of Prussia, the Minister of Commerce has ordered that potatoes be carried at the rate of about one cent per ton per mile on all the State railroads. This is at the rate of 45 cents per hundred from New York to Chicago, which is more than is charged for first-class freight at present.

—The Milwaukee Sentinel reports that the freighting business between Milwaukee and Grand Haven, across Lake Michigan, was never so heavy as during the past season.

SCRAP HEAP.

Hoosac Tunnel.

During the month of October the progress in the Hoosac Tunnel was as follows: East end heading, 161 feet; west end heading, 101 feet; brick arch, 42 feet; central section no excavation. On Monday week the buckets at the central shaft were taken out, and safety cages similar to those in use at the west shaft were substituted. These cages are much larger than those at west shaft, being capable of holding from 15 to 18 men. Machine carriages are now in the tunnel at the bottom of the shaft and work with machine-drills has fairly begun.

British Rail Exports in October.

Heyerdahl, Schöenberg & Co., give the following monthly report of exports of railway iron from Great Britain, extracted from Government returns:

	Month End'g Oct. 31.			Ten Months End'g Oct. 31.		
	Tons. 1869.	Tons. 1870.	Tons. 1871.	Tons. 1869.	Tons. 1870.	Tons. 1871.
United States.....	18,743	28,219	52,174	262,829	341,629	441,709
Russia.....	50,607	10,196	5,630	247,278	204,005	75,028
Austrian Territory.....	553	2,578	3,281	22,317	35,495	21,872
British India.....	10,320	8,658	1,064	70,200	140,845	31,862
British N. America.....	260	4,793	3,177	23,929	34,705	59,886
Egypt.....	26	102	2,526	6,051	2,116	5,678
Australia.....	2,004	417	407	19,842	7,798	12,014
Brazil.....	1,091	281	1,772	2,913	2,292	17,191
Holland.....	293	232	1,316	10,078	15,312	10,360
Spain and Canaries.....	613	936	2,093	11,609	10,890	10,761
Sweden.....	505	474	440	3,938	2,505	7,748
Chile.....	115	869	840	2,762	13,849	11,164
Spanish W. India Islands.....	10	547	885	3,198	2,573
Peru.....	319	3,682	18,739	13,680	22,175
Germany.....	5,345	3,205	1,810	30,328	47,420	45,959
France.....	315	30	908	4,255	362	2,624
Other countries.....	5,744	6,441	8,569	59,705	54,970	67,972
Total.....	96,444	69,773	90,236	793,619	931,991	846,606
Total exports from Great Britain of iron and steel to all countries.....	263,613	236,336	312,463	2,308,714	2,448,811	2,604,379

Wabash Bridge of the St. Louis & Southeastern Railway.

Mr. A. R. Fautleroy, the engineer of this bridge, describes it as follows, in a letter to the *United States Railroad and Mining Register* dated November 13:

"The bridge over Wabash River, the most important structure on the line, has a total length of 3,815 feet, including the pile bridging on the approaches, the bridge proper being 1,100 feet in length, of the Howe truss pattern, composed of two spans of 160 feet, three spans of 180, and a draw of 240 feet. Its construction was commenced last December. The two extremities rest on pile abutment. The six stone piers are founded on 510 piles driven 20 feet in the bed of the river, sawed to a level three feet below low water with floating saw-mill and protected with rip-rap and sheet piling. The caissons with bottoms of oak timber two feet deep were sunk and piers started by triangulation from base lines on shore. The last foundation pile was driven May 19, last caisson sunk August 24 and masonry completed October 13. The superstructure now being erected will be completed, it is hoped, and trains crossing in three weeks, and the road in good order for trade."

Virginia Cars in the North.

The Tredegar Works Company, of Richmond, Va., have a contract to build nearly three thousand coal and freight cars, and which are to be used on the Midland New York & Oswego Railroad, Dutchess & Columbia road and the Chesapeake & Ohio road.

Safety Car Platforms in Ohio.

Says a telegram in the *Cleveland Herald*: "Early in September the attention of the various railroad companies having lines of travel in this State was called by Commissioner Wright to the act of the last Legislature, requiring that all passenger cars be supplied with such platform attachments as will secure the safety of passengers from accident. The law, which took effect on the first of September, required the Railroad Commissioner to attend to its enforcement. Responses have

been received from the managers of nearly all the leading lines of road to the effect that arrangements are in progress by which the law will be complied with. Time is required to secure the manufacture of whatever apparatus is adopted in each case, and in some instances the officers of the roads have appealed to the Commissioner for delay, for the reason that they had been ignorant of the existence of the statute referred to. In all cases where there is a disposition manifested to comply with the law as early as practicable legal proceedings have been dispensed with. It is anticipated that all the roads doing business in this State will be able to show a substantial compliance with the law at an early day."

Heating Cars on German Railroads.

In Germany there are no less than thirteen different modes of warming railway passenger carriages more or less in use, though by far the greater part may be considered still as experiments, and the original plan of hot-water bottles appears to be most generally adhered to, and the most practical and economical way of solving the problem. We have before us a list of fifty-five German railways, showing the means they employ for the very desirable end they have in view for the comfort of the traveling public; and while some are content to retain the use of the old-fashioned portable hot-water bottle exclusively, others are experimenting with three or four new methods, which will account for the difference of numbers between the above fifty-five and the hundred in the subjoined list: Hot-water bottles, 39 railways; hot-air, 3; heating by circulating water, 5; Fayence stoves, 1; stoves with iron jackets, 5; Schlutt's patent stoves, 7; heated sand bags, 9; Berghausen's invention of warm boxes, 4; calorifiers, 1; heated bricks, 3; heating by steam from the locomotives, 7; steam from separate boilers, 6; and heating with prepared coal, 10. It appears that the barbarous custom of leaving unheated the third and fourth-class passenger carriages obtains almost without exception—at least, the reports before us make no mention of them, and only speak of heating the first and second-class carriages. With regard to the fourth-class carriages, the Thuringian Railway says expressly they are warmed by a stove; the Saarbrücken State Railway and the Hanoverian directors speak of it as "under consideration," and the Lower Silesian Branch Railway are making experiments for warming the fourth-class carriages on their line with large metallic cylinders filled with hot water. Third-class passengers appear to be better cared for in this respect, as we find that a heating apparatus of one kind or another is introduced on the Taunus Railway, the Nassau State Railway, the Saarbrücken, and two or three more; the Thuringian have put up stoves, as in their fourth-class carriages; the Hanoverian directors have it "in contemplation." On the Brunswick State Railway "one third-class carriage" has been fitted up with an iron jacket stove heated from without. The most backward in this respect is the Altona & Kiel Railway, which confesses to heating only first-class compartments and occasionally some of the second-class ditto with stone bottles filled with hot water.—*London Railway News.*

New Signal System.

An exchange gives the following account of a new system of signals which the Fitchburg Railroad has been trying for several weeks:

"A narrow box, about twelve feet high, has glasses so arranged that a white, green or red light can be shown. Immediately after the passage of every train or engine the red or danger-signal is shown for six minutes in the direction from which it approached. The signal is then changed to the green or caution-signal, which is shown for six minutes. The white or safety-signal is then adjusted and kept in that position until the arrival of the next train or engine. When the red light is shown engines are to reduce speed to five miles an hour, and when the green is shown to ten miles an hour—until such signals are changed at other stations. When trains are dangerously close, an additional red light is to be shown at night and a red flag in the day-time. The whole system is easily managed by the station agent or gate tender, and gives much satisfaction."

New Fairlie Engines.

An English paper has the following: "The engine Hercules is for the Iquique Railway, in Peru, and is of the same general character as one previously made for the same company, and already described in the *Railway News*. It has four 15-inch cylinders, of twenty-two inches stroke, and its total weight (sixty tons) rests upon twelve wheels, arranged in two groups of six, coupled together, and all assisting in the adhesion. It will be required to work heavy traffic over a gradient of one in twenty-five for eleven miles, and round curves of three chains; and during the experiments on Friday it went round curves of 2½ chains with the greatest facility, the deflection of the center of the leading bogie platform from the end of the boiler amounting to fourteen inches. It was then taken through a boiler-shop and a smith's shop, and so upon a very irregular and badly-kept piece of line belonging to the Midland Company. Here its trip was restricted by certain bridges and platforms which it could not pass; but it ran up and down, over a length of about a quarter of a mile, with the perfect smoothness for which the double bogie is so remarkable. Its passage over roughly-laid points was distinctly audible to those riding upon it, but communicated no jolt to the driver's platform. It has been built by the Avonside Company, for Messrs. Montero, of Peru."

"The double bogie engines for the Peruvian line of 2ft. 6in. will be required to work over long gradients of one in twenty, and round curves of 2 chains radius. It is estimated that they will do this at thirty miles an hour, and that they will be equal to any traffic which a railway can be called upon to undertake. We learn also that various English engineering firms have now double-bogie locomotives in course of construction, to the number of nearly fifty, for lines, mostly of narrow gauge, in Peru, Mexico, Canada, Nova Scotia, New Zealand, Russia, Sweden and Brazil."

Changing Gauge on the Maine Central.

The change of the gauge of the section of the Maine Central Railroad between Waterville and Danville made necessary the drawing and driving of 588,000 spikes. There were 220 men employed in making the change, working in squads of 12 each. In these squads 4 men drew the spikes, 2 moved the rails to the new position, and 6 drove the spikes in their new places. The line between Waterville and Winthrop, 29 miles, was changed in 3 hours and 20 minutes on Thursday, and the next day the line from Winthrop to Danville, 26 miles, between 8 and 12 o'clock.

Iron Lake Steamers.

Messrs. Holt & Ensign, of Buffalo, are now having four iron steamers built at that city, which, when completed, will be the largest and most valuable vessels afloat on the lakes, having an aggregate freight capacity of 260,000 bushels of wheat. The dimension of each will be as follows: Length, 240 feet over all; breadth of beam, 35 feet; depth of hold to moulding, 15 feet. They will be built with five compartments, with water-tight iron bulkheads, and furnished a patent water bottom, which enables them to ship and discharge water ballast. Each engine will have a direct-acting cylinder of twenty inches diameter and thirty-six inch stroke. The diameter of the condensing cylinders will be forty inches. Each steamer with machinery and all complete will cost about \$175,000, and will have a freight capacity of 2,000 tons. The Huron Iron Works are building two of the boats and the Shepard Works the others. All four will be completed next season. Two will be launched in April and the other in July. —*Detroit Post.*

Ohio Falls Car Works.

Says the Indianapolis *Evening News*:

"The Ohio Falls Car Works, at Jeffersonville, Ind., employ six hundred hands, paying them an aggregate of \$30,000 per month. One hundred thousand bushels of coal are used annually. In the casting shop twenty-eight and a half tons of iron are used daily. The works turn out ten freight cars per day and five passenger cars per month. The buildings cover three and a half acres of ground, and the lumber yard fifteen acres. Mr. John Gunckle, one of the best car builders in the United States, has charge of the building department."

Contracts on Sault Sainte Marie Canal.

The Portage Lake (Mich.) *Mining Gazette* gives the following particulars concerning the last contract let by the Government on this work:

"The amount to be expended under this new order of things is \$250,000, which will not be sufficient to finish the bare canalway, to say nothing about the new locks, which it is thought will cost nearly a half a million of dollars. Messrs. Barker & Williams receive \$2.40 per cubic yard for rock excavation, 70 cents per cubic yard for gravel, 20 cents per cubic foot for timber, \$25 per 1,000 feet for pine plank, 5 cents per pound for iron bolts, 7 cents per pound for spikes. They get 10 cents per cubic yard for framing and putting in place all timber, &c. Their work under this contract is to be finished by the 1st of July, 1873."

The Westinghouse Brake in Tennessee.

On the 22d ult. a trial of the Westinghouse brake was made on the Memphis & Charleston Railroad near Gill's station, about four miles from Memphis. The Memphis *Avant-courier* gives the following account of the trial, which was made with an engine and three cars:

"Three trials were made, the train running, it is supposed, about thirty miles an hour when the brake was applied. The first time it was 26 seconds from the time the brake was applied until the train came to a stand just 800 feet from the spot where the brake was used. The second trial the train was stopped within the same distance in 23 seconds, and the third and last trial Mr. Burke stopped it in 20 seconds and 700 feet, or 233½ yards. In the stopping there was none of those disagreeable, nerve-destroying, head-splitting jerks that are invariably experienced in the stoppage of trains by the old system of hand brakes. On the contrary, it was even smoother riding with the brakes applied than when off."

An Improvement in Sleeping Cars.

The Pittsburgh *Commercial* gives the following description of an improved sleeping car recently exhibited there, the invention of Mr. Jonah Woodruff, whose Silver Palace line of sleeping cars was absorbed about two years ago by the great Pullman Company:

"The car is of the pattern known as the 'round end,' with a rotunda at either end, in which is a toilet room, containing wash-stand, drinking fountain, etc., with an inner room for water closet, entirely separate. The rotundas are dome-shaped, inside and outside, are beautifully frescoed, and handsomely furnished throughout. Every passenger on the coach has a right to use these apartments. The body of the car presents an extremely neat, elegant and spacious appearance. All the partitions, columns and other obstructions—in a word, all the 'lumber' which meets the eye in the ordinary sleeping coaches—are entirely done away with. By an ingenious arrangement the upper berths are taken from recesses between the seats, and the bed clothing, curtains, etc., form recesses under the seats, thus making a perfect parlor car by day and a most comfortable sleeping coach by night. On entering, the passenger sees nothing to indicate that he is in a 'sleeper,' as compared with an ordinary car, except that the seats are arranged back to back. There is an unobstructed view from end to end, and the 'burial casket' aspect of the old 'sleepers' is wholly avoided. Nor is this all. The car is better lighted, as, in addition to the ordinary window at each seat, there is a narrower light of glass between the seats, of the same length, and about half the usual width. This adds materially to both the comfort and elegance of the car. The ceiling is as high as that of the ordinary coach, giving an unobstructed view and a free circulation of air. Each car is lighted at night by three beautiful lamps, in addition to those in the rotundas. At each end of the car is a fine mirror. The mounting of the lamps, drinking fountains, wash-basins, etc., is of the best nickel plating, and

forms a pleasant contrast with the elegant upholstery. The car is heated from two stoves—one in each rotunda—the hot air being conveyed by a pipe, and discharged through a register."

The *Commercial* says that while these cars are quite as elegant and comfortable and as fully supplied with conveniences as the best modern sleeping cars, they weigh only twenty tons, which is ten tons less than most of the fine sleeping cars made recently. Such a saving in dead weight, it need not be said, is of very great importance, especially on railroads with heavy grades, like the Pennsylvania and the Baltimore & Ohio. Some such improvement has been very much needed, for our railroads are now carrying nearly or quite 1,000 pounds more per passenger in the sleeping cars than in the ordinary first-class cars.

Railroad Construction in Kansas.

The following remarkably intelligent and well-considered article was contributed to the Kansas City *Journal of Commerce*, and published October 11:

It is said that experience is a school in which the lessons learned are exceedingly costly; it may, we think, with equal truthfulness be said that it is a school in which the progress of the learner is exceedingly slow. Magnificent financial bubbles have successively arisen upon the air, have burst, and dissolved the hopes and expectations of thousands. It is to no purpose that victims without number have staked their wealth and character on the ability of one humbug to sustain itself, and have involved themselves in ruin and disgrace, are still found ready to clutch at every new one that is blown from the breath of rascally speculation. It is hardly necessary to refer to, in recent times, the wild speculations in oil stocks, mining stocks, and numerous other prevalent stock speculations of a like character to illustrate the above remark. In railroad building, too, repeated inflations have preceded fatal collapses involving thousands in hopeless financial ruin.

We have great reasons to fear that schemes, modified only to catch the popular idea of the times, are now being conceived, and their execution attempted, in Kansas, which will entail irretrievable loss both on the people of that State and on others who will be innocently drawn into them.

The rapidity with which railroads in Kansas are being projected and built far in advance of population and business, and in some instances where railroads will never be required, and where in consequence it will be disastrous to build them, foreshadows a not distant result, which it is not too much to say is, to thoughtful men, fearful to contemplate. Notwithstanding the fact that at the present time there is hardly a road now being operated in Kansas whose earnings are in excess of its expenses; and that if no additional roads were built for the next five years in the State, and it should continue to increase in population and business as fast during that period as it has in the last five, the increased amount of business at the end of that period would not be more than sufficient to render the operation of the roads already constructed remunerative, at the average rate of charges that obtain on western roads in other States, yet other roads are rushing in to share the meagre business that now exists. Experience has shown that the proportion of population to railroads should be in the ratio of from 700 to 800 of population to each mile of railroad to render it safe to build, or profitable to operate them. There is in Kansas to-day an average of not to exceed 300 population to each mile of railroad in actual operation. Notwithstanding this, there are a number of additional roads projected in every part of the State, with an average length of line which it would be difficult to calculate. Municipal bodies throughout the State are being called upon to subscribe stock in, and loan their credit to these various schemes, and are responding to the calls with a reckless profusion. It would seem also that there are enterprising men ready to relieve the counties and towns of their bonds, and to undertake to build some of these projected roads, the franchises of which will be absolutely worthless when built, the only value attaching to them being the amount the iron and rolling stock will realize at a sheriff's vendue.

The scheme which is the boldest in conception, and promises to be the most fruitful to its projectors, and least so to its bondholders, is a three-foot-gauge road projected from Leavenworth City, Kansas, to Denver, in the Territory of Colorado. This is a road having a trunk line of a little more than 600 miles; 300 miles of which is over an uninhabited and inhospitable region of country. It is also proposed to throw out from the main line lateral branch lines into various parts of several of the counties through which the main road is to be built, which will nearly equal in length the trunk line, with no other object in view, it would seem, than to increase the number of miles to be mortgaged, and induce the counties through which it is proposed to build the roads to be still more wild in their extravagant speculation.

There are already constructed and in operation in that portion of Kansas north of the Kansas River, three lines of roads on the ordinary 4 feet 8½ inch gauge, running east and west, viz.: The Kansas Pacific, having a length in the State of 470 miles, the Central Branch Union Pacific, now operating 100 miles, and the second 100 miles in process of construction, and the St. Joseph & Denver road, also operating 100 miles. These three parallel roads are within an average distance of twenty miles of each other. The population in that part of Kansas does not exceed 150,000, as shown by the last census. It would seem that nothing but a fatal madness could prompt the building of an additional parallel line where the roads already constructed, in whole or in part, would be amply able to do the accumulating carrying business of that whole region for the next fifty years. It cannot help the matter to continue the line on to the mountains. The road already operating to the mountains finds that the western end is but lightly burdened with freights and passengers.

A most interesting part of this proposed performance is

the branches which are to be thrown off from the main line, presenting to the unprofessional eye more the appearance of a spreading oak than a scientific system of feeders. Numerous creek bottoms, sustaining not more than a score of farmers, are to be threaded with the "narrow gauge," and the little tracks are to meander like labyrinthine net-work among the sparse settlements of Northwestern Kansas. It can hardly be imagined that it is intended to build these various branches that are promised to the people of the counties along the proposed line, and it is quite noticeable that the promises are made by itinerating and irresponsible agents, who, without being clothed with authority, are sent out into the country districts to solicit the municipal aid.

The topography of Kansas clearly points to the system of railroads in that State, which, while it would be the least costly to construct, would at the same time be of most utility to the State. The roads should follow the main river lines, the through or trunk roads being supplied with feeders running up the minor streams, as, for instance, the Republican, Solomon and Saline rivers, in the northern portion of Kansas, all of which embrace fine bodies of lands, and which will contain the densest populations and the greater part of the wealth of the State.

These streams running northwesterly, and distributed over the central and western portions of the State, at convenient distances, are eminently adapted for feeders, by which the main lines may be strengthened. But to cross these great valleys with a number of through lines which will never be needed is to spurn the precious advantages with which nature has endowed the State, and follow folly for a guide.

The people of Kansas possess a vital interest in the proper development of her railroad system, which, it is feared, is too little understood or appreciated. It has already been stated that the construction of these feeding lines will very materially strengthen the main lines of roads Kansas needs to have. What Kansas most needs, now, is a judicious system of feeding lines to those main thoroughfares, upon which she must rely for her connections with Eastern lines, and her communication with commercial marts, to which she must ship her surplus productions. The State cannot expect to get the reduced rates of charges for transportation over her roads which obtain in older States until the main lines have thus strengthened themselves by reaching out their arms for an increase of business and traffic; so that the operations of the trunk lines have become remunerative to their owners; or if she does, she will most certainly be disappointed. To ask it is to demand a share in the profits of an operation before the profits have been realized, or the conditions have obtained upon which only profits can be realized.

To encourage the building of additional through lines along portions of the State where they are needed, is to destroy the very conditions upon which alone profits can accrue in which her people can share.

We hesitate not to assert that, in voting aid to construct additional through lines of road in the northern part of Kansas, the people of that State are making cords with which to bind mill-stones around their necks. But if another road must be built across the State, it is no less folly to build a three-foot gauge road; except upon the theory that, as it is not needed, and will be worthless when built, there will be less money wasted in building it. Since a narrow-gauge road and its rolling-stock have but about one-third the capacity of the ordinary gauge, it is evident that it would require three times the amount of rolling-stock, costing considerably more than stock of the ordinary gauge, and requiring a greater number of hands to operate it, to do the same amount of work of an ordinary gauge road. To state that the operating of a three-foot-gauge road, in proportion to the work done, is much more expensive than the operating of a four feet eight and a half inch gauge, is revealing nothing that has not been known to all railroad men for years, and that is not capable of the most certain demonstration.

The objection to the construction of a three-foot gauge trunk line through Kansas, arising from the necessity of breaking bulk on all through freight at the Kansas State line, is met by the assertion, reiterated with a mirth-provoking gravity, that a three feet track is to shoot out from Leavenworth to New York City and other commercial centers.

It may not be the least interesting part of this narrative to state how it is proposed to raise the means with which to build this three feet road.

The counties in Kansas through which the road is projected are asked to contribute county bonds to the amount of about \$4,000 per mile, for the number of miles of road built in the respective counties, except Leavenworth county, the credit of which has been already stretched to its utmost capacity, and it contributes its quota in Kansas Pacific stock. This stock will help to grade and tie the first fifty miles. Upon this a twenty-eight pound rail is to be laid, which is to be purchased upon a credit of one year with the personal obligation of the gentlemen who have charged themselves with the task of building the road. The cost of construction and equipage will, it is estimated, not exceed \$10,000 per mile.

Upon this it is proposed (and it is authoritatively asserted arrangements have been made to that effect) to negotiate mortgage bonds for \$15,000 per mile, at 80 cents on the dollar—affording a net profit to the projectors upon the construction, of several thousand dollars per mile. It is expected to repeat this process until the whole line is completed, suffering this additional tax, however, viz.: the payment of matured coupons of mortgage bonds first issued out of subsequent sales of bonds. It may be of some interest to ask who is to operate this road when built? And we can only answer that this is a problem which will in all probability be successfully solved only by a receiver in equity, when, there being no further roadway upon which to hypothecate bonds, out of the sales of which the interest accrued can be paid, profits on construction cease.

Kansas will have a worthless road, towards the building of which some of her citizens will have contributed aid to the amount of over one million of dollars.